
U.S. ARMY INSTITUTE OF SURGICAL RESEARCH ENVIRONMENTAL ASSESSMENT



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EXECUTIVE SUMMARY

This Environmental Assessment (EA) was prepared in accordance with guidance provided in Army Regulation (AR) 200-2, *Environmental Effects of Army Actions*, dated December 23, 1988, implementing the National Environmental Policy Act (NEPA) (42 USC 4321-4347). This EA, *U.S. Army Institute of Surgical Research Environmental Assessment*, was prepared by the U.S. Army Medical Research and Materiel Command with assistance from Science Applications International Corporation (SAIC) under Contract Number DAMD17-98-D-022.

The proposed action and subject of this EA is the continuation of current and currently planned activities at the U.S. Army Institute of Surgical Research (USAISR) located at Fort Sam Houston (FSH), San Antonio, Texas. The USAISR provides laboratory and clinical research directed toward improving the trauma care received by U.S. service personnel, with primary focus on the treatment of burn and extremity injuries. Activities conducted at the USAISR also include basic research in the medical sciences and studies to assess medical products and devices that are in advanced stages of development. The services provided by the USAISR contribute to advancements in medical care, especially trauma care, available to U.S. service men and women. The benefits resulting from USAISR research, and the availability of USAISR services, extend beyond the military. As the only dedicated burn and extremity trauma research care facility in the U.S. military, the USAISR admits between 250 and 400 burn and orthopedic patients for medical and surgical care and treatment each year. In addition to its role in medical research and teaching, the USAISR provides trauma support to the San Antonio area and throughout the world.

During the preparation of this EA, two alternatives to the proposed action were identified. These alternatives include relocating USAISR activities to another geographic location (Alternative II), and ceasing USAISR activities (Alternative III, no action). This EA characterizes the reasonably foreseeable environmental impacts, including impacts to human health that might result from current and currently planned USAISR activities (Alternative I, the preferred alternative) and the alternatives considered.

The principal conclusion of this EA is that current and currently planned USAISR activities (Alternative I, the preferred alternative) are unlikely to result in significant adverse environmental impacts and are likely to result in important benefits to the U.S. by enhancing medical knowledge and treatments available to injured service personnel. Relocating USAISR to another location (Alternative II) will not likely alter the environmental impacts associated with conducting USAISR activities, but will delay achieving USAISR mission requirements. Discontinuing USAISR activities (Alternative III, no action) will eliminate the minor to negligible environmental impacts associated with conducting USAISR activities, but will also eliminate the significant benefits resulting from USAISR research and medical services.

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1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

This Environmental Assessment (EA) analyzes the environmental impacts of continuing the current and foreseeable future clinical and laboratory research activities at the U.S. Army Institute of Surgical Research (USAISR), at Fort Sam Houston (FSH), San Antonio, Texas. The USAISR provides both laboratory and clinical research directed toward improving the trauma care received by U.S. service personnel, with primary focus on the treatment of burn and extremity injuries. Activities conducted at the USAISR also include basic research in the medical sciences and studies to assess medical products and devices that are in advanced stages of development.

The services provided by the USAISR support the continued advancement of the medical care, especially trauma care, available to U.S. service men and women. The benefits resulting from USAISR research, and the availability of USAISR services, extend beyond the military. As the only dedicated burn and extremity trauma research care facility in the U.S. military, the USAISR admits between 250 and 400 burn and orthopedic patients for medical and surgical care and treatment each year. In addition to its role in medical research and teaching, the USAISR provides trauma support both in the San Antonio area and throughout the world. The USAISR provides critical care services to civilians in San Antonio and has provided expertise, staff, and facility support to medical operations in Bosnia (1996), Pope Air Force Base (1993), Somalia (1993), Operation Desert Shield/Desert Storm (1991), Operation Just Cause (1989), and Ufa, Russia (1989). The concept of the burn flight team originated with USAISR and is now widely used in transporting burn victims to appropriate specialized centers. The USAISR burn flight team provides such transport to the USAISR burn center.

USAISR activities are an essential component of the U.S. Army Medical Research and Materiel Command (USAMRMC) Combat Casualty Care Research Program, the purpose of which is to improve medical technology available for soldiers injured on the battlefield. One of six USAMRMC subordinate laboratories, USAISR contributes to the USAMRMC mission to protect the health and safety of military personnel and to develop medical materiel and procedures for treating and rehabilitating the injured.

This EA describes the potential adverse environmental impacts, including human health impacts, associated with ongoing activities conducted at the USAISR (see Section 2) and two alternatives to the proposed action (see Sections 3 and 5). This analysis considers impacts expected from and currently planned ongoing activities in their present size and scope, cumulative impacts that might occur after several years, impacts resulting from association with other activities in the area, and impacts resulting from an accident or incident.

The National Environmental Policy Act (NEPA) (42 USC 4321-4347) requires that each federal agency consider the potential environmental impacts associated with proposed major actions. The Council on Environmental Quality (CEQ), Executive Office of the President, has promulgated regulations implementing NEPA (40 Code of Federal Regulations [CFR] Parts 1500-1508). Army Regulation (AR) 200-2, *Environmental Effects of Army Actions*, dated December 23, 1988 (32 CFR 651), is the Department of the Army (DA) implementation of NEPA and the CEQ regulations. This EA was prepared in accordance with AR 200-2 and CEQ regulations.

To reduce redundancy with previous relevant documents as required by CEQ regulations, this EA is tiered, in part, to earlier relevant NEPA documentation including the *Environmental Assessment of the Overall Mission, Fort Sam Houston, Texas* (U.S. Army Forces Command [FORSCOM], 1991), and the *Final Environmental Impact Statement for a Proposed Brooke Army Medical Center (BAMC) at Fort Sam Houston, Texas* (U.S. Army Corps of Engineers [USACOE], 1988). This approach entails referencing specific analyses, discussions, and conclusions of these documents without providing detailed discussions in the present EA.

2.0 DESCRIPTION OF THE PROPOSED ACTION

2.1 Introduction

The proposed action evaluated in this EA is the continuation of activities conducted at the USAISR located at FSH, San Antonio, Texas. The USAISR provides both laboratory and clinical research directed toward improving the medical care and treatment received by injured U.S. service personnel with primary focus on the treatment of burns and extremity injuries. The USAISR contributes to the overall U.S. Army medical research community by identifying, characterizing, and prioritizing the challenges of caring for critically injured soldiers and developing products and treatments to improve this care.

2.2 Location and Facilities

The USAISR was established in 1943 at the Halloran General Hospital on Staten Island, New York. In 1946, the USAISR moved its activities to its present location to FSH. The FSH Installation is located within the city limits of San Antonio (Bexar County, Texas) about 2.5 miles northeast of the downtown area (Figure 2-1). The FSH Installation is situated on 3,150 acres and has been the site of military activities since 1845.

The USAISR is one of many tenant activities on the FSH Installation. Among the major tenants of FSH is the BAMC, a 600-bed hospital located on 50 acres on the eastern edge of FSH (Figure 2-2). The BAMC is currently the newest and largest of the eight U.S. Army medical centers. USAISR facilities are located on the grounds of BAMC, both within the BAMC Main Hospital Building (Building 3600) and in a dedicated adjacent building (Building 3611). Both the BAMC and USAISR occupy newly constructed facilities. Construction of Building 3611, which houses most USAISR activities, was completed in March 1996. The BAMC facilities which USAISR uses were completed in April 1996. USAISR facilities encompass about 9.7% of the total square footage of BAMC. An Environmental Impact Statement (EIS) was prepared for the construction of the BAMC and finalized in December 1988 (USACOE, 1988).

The USAISR is organized into three divisions: the Clinical Research Division, the Laboratory Division, and the Support Division (Figure 2-3). The Clinical Research Division operates within a 50,300 square foot, 40-bed inpatient research center on the fourth floor of the BAMC Main Hospital Building (Building 3600). The Laboratory and Support Divisions are both located in Building 3611, occupying 73,850 and 11,000 square feet, respectively (Bentz, 1998a).

2.3 USAISR Mission and Organization

The mission of the USAISR is to provide “medical solutions and products for injured soldiers by integrating laboratory and clinical research” (Bentz, 1998a). USAISR goals encompass thermal injury research and care; developing research models for testing products at advanced stages of development; and the continued development of products, devices, and literature concerned with providing trauma treatment. Both USAISR and BAMC are subordinate to the USAMRMC, which is subordinate to the U.S. Army Medical Command (MEDCOM). The FSH Installation

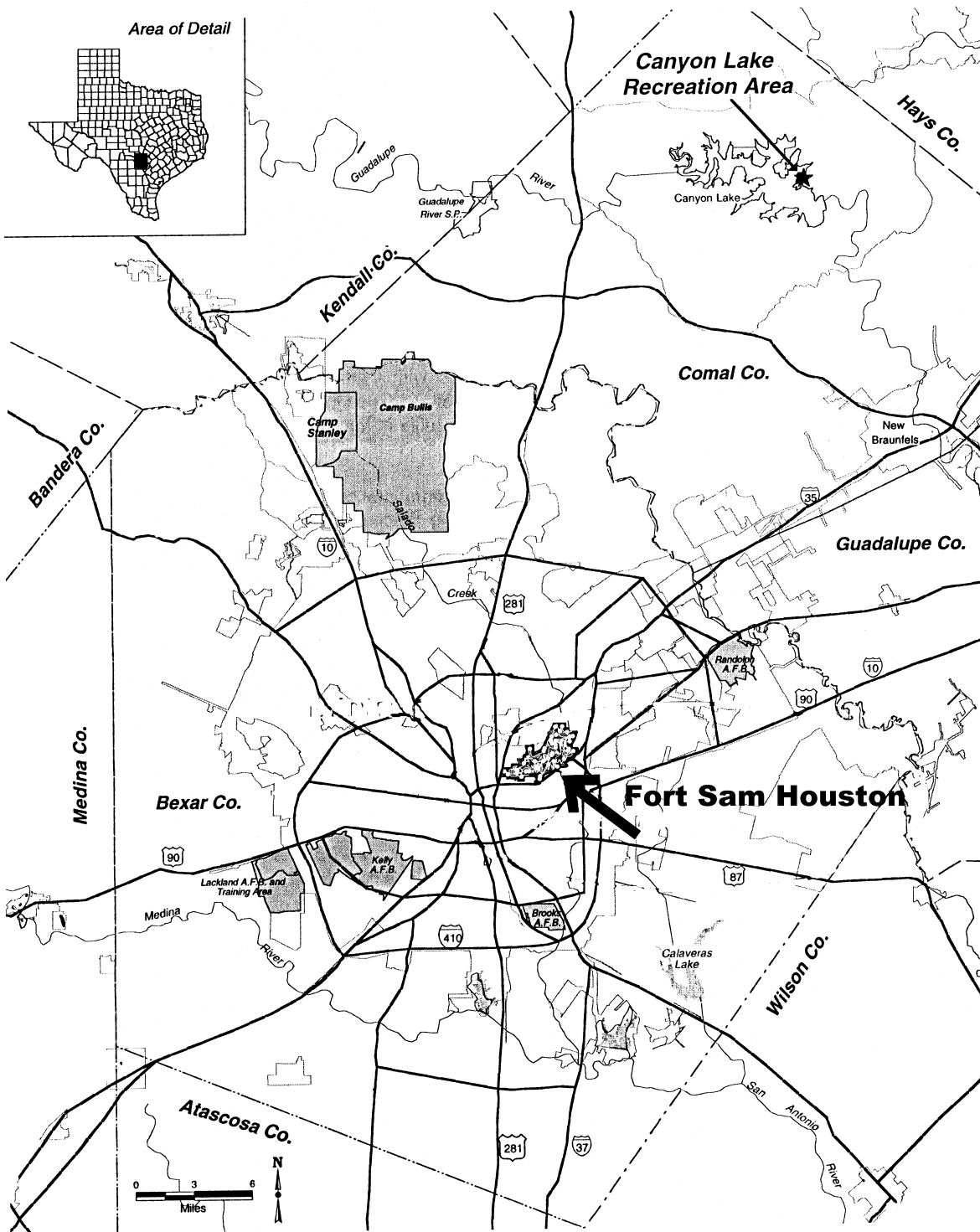


Figure 2-1. Location of Fort Sam Houston in San Antonio, Texas

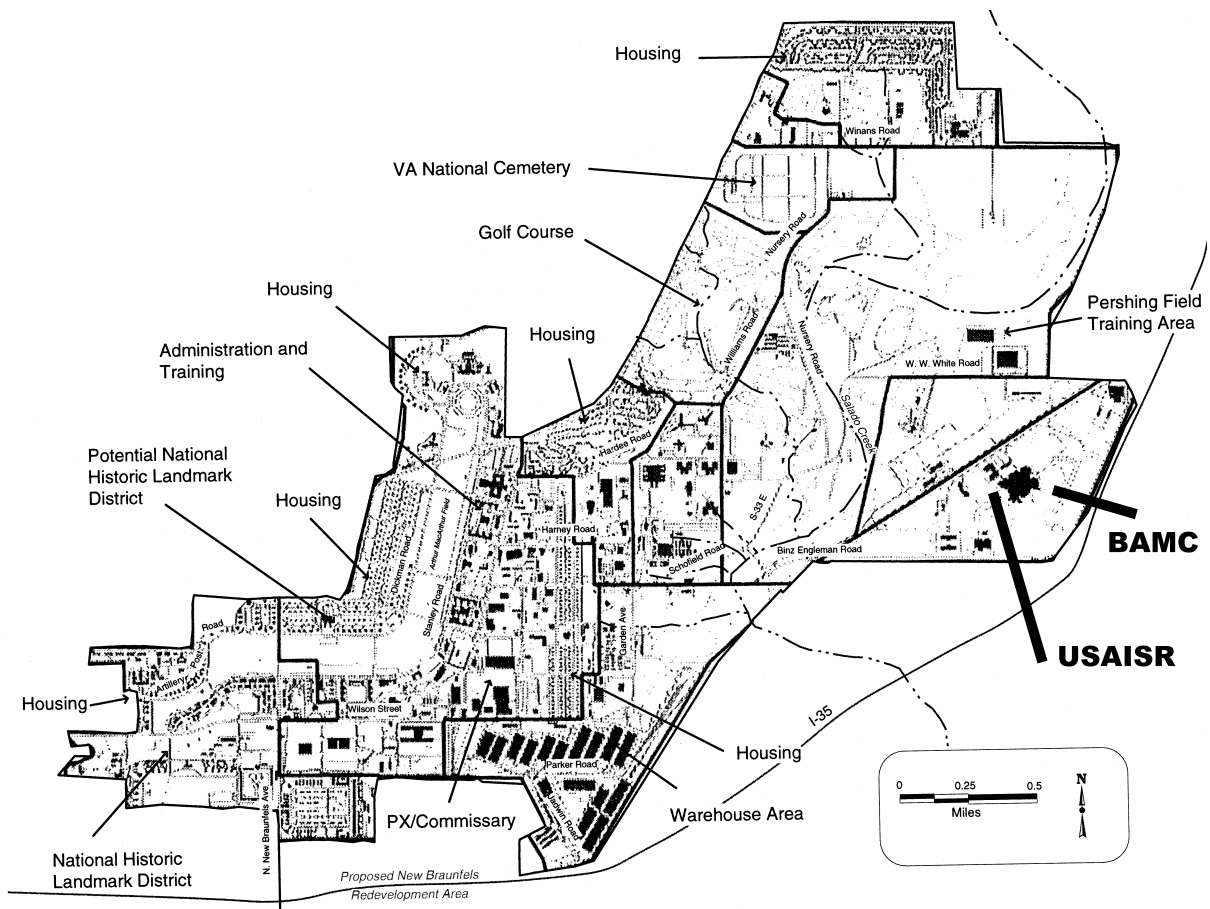


Figure 2-2. Location of BAMC and USAISR on Fort Sam Houston

has been under the command of MEDCOM since October 1995, prior to which it was under the command of the U.S. Army Forces Command (FORSCOM).

The U.S. Army Garrison provides administrative support for the Installation and its tenants. The USAISR receives services from the Garrison as well as other FSH resources for security, safety, waste handling and disposal, and environmental management. The USAISR receives technical support from BAMC in such areas as infection control, preventive medicine services, and safety. Most of the permits required for different aspects of USAISR operations are held by either FSH at the Installation level (e.g., hazardous waste, wastewater) or BAMC (e.g., regulated medical wastes, radioisotopes).

2.4 Activities

Activities performed at the USAISR include basic laboratory research, product testing and evaluation, pathology, and the range of activities associated with patient care and treatment. The USAISR staff is composed of medical and veterinary clinicians, research scientists, nurses, allied health professionals, administrators, and support personnel. The USAISR provides medical education to health professionals from all of the U.S. armed services, civilians, and foreign countries.

The USAISR Clinical Research Division conducts clinical studies and treats patients in facilities located on the fourth floor of the BAMC Main Hospital Building. Ongoing investigations include studies in microbiology, biochemistry, basic cell research, infection, and wound healing research. The Laboratory Division performs basic and applied research and provides ancillary support for research protocols involving acute trauma, hemorrhage, resuscitation, orthopedic care, vascular and tissue engineering, metabolic studies, and comparative medicine investigations. The USAISR Support Division provides administrative, audiovisual, logistical, and library services for both Clinical and Laboratory Divisions (Bentz, 1998a).

Among its clinical and laboratory research activities, the USAISR tests devices that have reached advanced stages of development and are ready to undergo evaluation in a treatment setting with humans or with animals. Devices studied include those for diagnosing or treating injured soldiers in emergency situations and have involved a monitor which transmits information about a soldier's position and physical status; adhesives that can rapidly stop bleeding and can be incorporated into bandages; and improved intravenous formulations for use in the critically injured.

Currently planned activities include preparing a ballistics laboratory for testing the effects of small projectiles (e.g., bullets and small fragments) on tissue simulants or excised tissue. Tissue simulants are blocks of gelatinous material, purchased from commercial sources, which were specifically developed for the assessment of tissue damage without the need for live animals. Current plans call for approximately 40 firings per month. Tissue simulants will be placed in a chamber constructed with thick metal walls and lined with a curtain of special fiber designed to reduce airborne particles (Bentz, 1998b).

2.5 Safety

Safety management is an integral component of activities conducted within all DA facilities. DA safety policy is detailed in AR 385-10 (The Army Safety Program) and applies to all DA personnel (military or civilian) involved in activities at DA facilities. Safety management at USAISR requires that written standard operating procedures (SOPs) incorporate the requirements of Department of Defense (DoD), DA, other federal, state, and local safety requirements. These SOPs detail the responsibilities and procedures required for specific tasks or work within designated areas. USAISR personnel are trained in applicable safety procedures at the onset of their duties and annually thereafter. The training received and applicable safety regulations are documented on BAMC Form 999 (Bentz, 1998c).

The USAISR safety officer relies on the technical expertise and management assistance of the BAMC Safety Office. Fire and/or safety monitors assigned within each USAISR division and section coordinate safety program implementation with the appointed USAISR safety officer and the BAMC Safety Office. BAMC resources are used in evaluating and monitoring various aspects of USAISR operations such as ensuring the proper functioning of engineering control systems (e.g., hood and ventilation systems). BAMC resources used in implementing USAISR safety policy and rules include the BAMC Safety Office, Preventive Medicine Section (medical monitoring, industrial hygiene), and Logistics Division (medical maintenance, housekeeping). The USAISR uses the services of BAMC facilities engineers (currently contracted through Johnson Controls, Inc.) (Bentz, 1998c).

Various aspects of USAISR operations undergo inspection. Laboratory safety inspections are conducted weekly, monthly, quarterly, and annually. The USAISR safety officer in cooperation with non-commissioned officers in charge (NCOICs) conducts safety reviews. Fire safety monitors and, when appropriate, BAMC safety personnel may assist in these efforts. Inspections are conducted with the use of a safety checklist (Bentz, 1998c).

Work involving potential chemical hazards is regulated by the Occupational Safety and Health Act (OSHA). Standards require that facilities prepare written plans summarizing policies and procedures that protect workers from chemical hazards and inform workers of the chemical hazards to which they may be exposed. OSHA requires that personnel be provided access to the facility Chemical Hygiene Plan, applicable OSHA regulations, and Material Safety Data Sheets (MSDSs) for chemicals in use. The USAISR and BAMC safety offices maintain a cumulative listing of the approximately 2,500 chemicals in use within BAMC and USAISR. Laboratory-specific chemical listings are posted at the entrance of each laboratory. Annual listings of chemicals in use are maintained by laboratory fire or safety monitors and the Section NCOIC and are forwarded to the BAMC Safety Office. MSDSs are available for chemicals at each site of use (Bentz, 1998c).

Personnel working with blood products, bodily fluids, and tissues must implement appropriate methods of exposure control in accordance with OSHA. Some USAISR research activities involve using microorganisms such as *Pseudomonas aeruginosa* or *Staphylococcus aureus* to study wound healing and infection in animals. Army policy requires that work involving

infectious or potentially infectious organisms must be conducted in accordance with the 1993 Centers for Disease Control and Prevention (CDC)/National Institute of Health (NIH) guidelines, *Biosafety in Microbiological and Biomedical Laboratories* (Bentz, 1998c).

The BAMC Fire/Safety Office has reviewed safety issues associated with the currently planned ballistics laboratory. Chamber construction and use have been approved. The criteria for approving personnel handling firearms are in preparation (Bentz, 1998b).

2.6 Security

Access into and within USAISR facilities is controlled. Visitors must register with staff duty personnel upon entering and are identified by visitor badges. Visitors are escorted at all times. Access throughout USAISR facilities is limited to authorized personnel and requires electronic access badges. In addition to controlling access, security measures include random and fixed security checks by guards and video surveillance (Bentz, 1998a). SOPs describe policies and procedures for securing government and personal property, and for the safety and security of research animals.

The FSH, San Antonio, and Bexar County fire departments provide USAISR with emergency fire services. Law enforcement services are provided by the BAMC Provost Marshal's office and emergency medical services are provided by the BAMC emergency room. The BAMC or FSH Provost Marshal would be notified of an attempted unlawful entry or civil disturbance. There have been no security incidents in USAISR facilities in the last 10 years (Bentz, 1998c). The *BAMC Emergency Preparedness Plan* outlines actions required for responding to emergencies and disasters (BAMC, 1997). BAMC Memorandum 420-3 contains an emergency evacuation plan for USAISR (Bentz, 1998c).

2.7 Pollution Prevention

DA policy requires that pollution prevention be incorporated into decision making about future actions and acquisitions. Pollution prevention practices must be incorporated into overall environmental management and must be considered in complying with NEPA and AR 200-2. Pollution prevention practices include the reuse or reclamation of hazardous materials to minimize their disposal, energy recovery, recycling, and reduction of source materials. A pollution prevention plan was completed at FSH in 1995. In collaboration with BAMC, USAISR is instituting a recycling program for paper products, cardboard, alcohol, formalin, and other products as equipment and means become available (Bentz, 1998d). Waste silver generated from photographic processes are also recycled through an Installation-wide program (Hottenstein, 1998).

2.8 Waste Stream Management

Wastes generated by USAISR activities include wastewater, general solid waste, hazardous chemical waste, and regulated medical wastes (e.g., sharps, bodily fluids, and potentially infectious materials). The collection, treatment, storage, and disposal of these wastes are regulated by law and must be in accordance with USAISR SOPs that implement the applicable federal, state, local, and DA regulations.

2.8.1 Wastewater

USAISR activities generating wastewater include laboratories, restroom facilities, patient care, and cage washing. USAISR generates approximately 8.5 million gallons of wastewater annually, approximately 9% of the total wastewater (88.7 million gallons) generated by the BAMC campus (Bentz, 1998d). Wastewater generated by BAMC and USAISR first undergoes an acid-removal treatment before discharge into the FSH wastewater stream (Bentz, 1998d; Hottenstein, 1998). Combined wastewater from USAISR and BAMC flows through the FSH sewer distribution system and ultimately into the Salado Creek Sewage Treatment Plant of the San Antonio Water System (SAWS) sewer system (FORSCOM, 1991; USACOE, 1996). FSH is permitted to discharge into the SAWS sewer system and is subject to the conditions required by the permit.

2.8.2 General Solid Waste

USAISR activities generate approximately 37 tons of solid waste annually (Bentz, 1998f), which is about 4.2% of the 878 tons of solid waste generated annually by all FSH activities. General solid waste does not contain regulated materials such as infectious waste or hazardous chemicals and is managed and disposed of without pretreatment. At USAISR, general solid waste is placed in trash receptacles located throughout the facility. Housekeeping contractors collect the trash and transport it to the dumpster located in the loading dock area outside of Building 3611. Solid waste transport from the Installation is accomplished through a private contractor. Currently, solid waste is disposed of in the City of San Antonio's Covell Garden Landfill in accordance with federal, state, and local regulations (Bentz, 1998d).

2.8.3 Regulated Medical Waste

The disposal of animal wastes, blood and blood products, microbiological waste, pathological waste, sharps, and special wastes from health care facilities is regulated. In 1997, USAISR activities generated 104,095 pounds of regulated medical waste, approximately 20% of the total regulated medical waste (427,337 pounds) generated by all of BAMC (Bentz, 1998d). Regulated medical wastes are segregated from the general waste stream according to BAMC Memorandum 40-403. Animal wastes potentially contaminated with infectious organisms must be autoclaved prior to disposal. Animal carcasses and potentially biohazardous material generated from the use of animals are placed in doubled, red biohazard bags; boxed in labeled cartons; and refrigerated. Boxed animal wastes are transported daily by a contractor to an off-site, private facility for incineration. Medical wastes are currently collected by American 3 CI and are ultimately incinerated at the contractor's facility in Carthage, Texas (Bentz, 1998d). Texas law regulates the transport and tracking of medical wastes.

2.8.4 Hazardous Waste

FSH is considered a large quantity generator of hazardous chemical waste (Pedraza, 1998). Hazardous chemical wastes generated by USAISR activities totaled approximately 1,360 pounds in 1997, approximately 10% of the total hazardous chemical waste disposed of by BAMC. Hazardous chemical wastes require special handling and tracking as described in BAMC Memorandum 40-48 (Bentz, 1998d). Hazardous chemicals and chemical waste are collected and temporarily stored in approved containers at satellite accumulation points (SAPs) before turn in to

the BAMC Safety Office. BAMC then transfers the accumulated hazardous chemical waste to the FSH Directorate of Public Works (DPW). The FSH DPW and a private contractor manage hazardous waste collection at the Installation in accordance with the *FSH Hazardous Waste Management Plan*. Ultimately, the hazardous waste generated at FSH is collected by a hazardous waste contractor for transport to an approved off-site disposal facility (Bentz, 1998d).

2.8.5 Radiological Waste

Current USAISR research activities do not require the use of radioisotopes. The USAISR is permitted to use radioisotopes under BAMC Nuclear Regulatory Commission (NRC) permit (NRC License Number 42-01368-01, expiration date 30 April 2001, docket number 030-03258) (Bentz, 1998c). This permit authorizes the use of specified radionuclides for research and development purposes. The handling and disposal of radioactive wastes must be conducted according to BAMC Memorandum 40-72 and the BAMC Health Physics Office (Bentz, 1998d). A small amount of radiological waste was generated by USAISR research activities in fiscal year 1996. Radiological waste are ultimately transported by contractor to Barnwell, South Carolina for disposal (Bentz, 1998d).

2.9 Storage Tanks

There are four active aboveground storage tanks located outside of Building 3611. Each of these tanks holds 12,000 gallons of diesel fuel for use in emergency generators, as needed. The *FSH Spill Prevention Control and Countermeasure Plan* and the *Installation Spill Control Plan* detail procedures for tank maintenance, containment, spill response, and security (Pedraza, 1998).

2.10 Human Volunteers

Some USAISR research activities require the use of human volunteers in Building 3600 (BAMC Main Hospital, fourth floor) and Building No. 3611 (USAISR Research Building) (Bentz, 1998c). Studies requiring human subjects must be reviewed, evaluated, and authorized by the Human Use Review Committee (HURC) before they are initiated. If a proposed study poses “more than a minimal risk” to volunteers, it must also be reviewed and authorized by The Surgeon General’s Human Subjects Research Human Use Review Committee (Bentz, 1998c).

Research requiring the use of human subjects must comply with federal, DA, and USAISR regulations in addition to the international standards established by treaty. These regulations also specify requirements for obtaining consent and maintaining confidentiality. The participation of human subjects must be voluntary and subjects must be fully informed of the research procedures and their associated risks. Volunteers acknowledge informed consent for participation in the study by completing DA Form 5305-R, *Volunteer Affidavit Agreement*. Research subjects may withdraw from studies at any time.

2.12 Animal Care and Use

Laboratory animals used in research at USAISR include mice, rats, rabbits, guinea pigs, pigs, sheep, goats, and dogs. During February 1998, the USAISR animal census averaged 356 animals, mostly rodents, rabbits, and guinea pigs (Bentz, 1998b). The Laboratory Animal Medicine

Service (LAMS) is responsible for animal research conducted at both BAMC and USAISR. The LAMS has developed SOPs governing all aspects of humane animal care and use including animal husbandry, personnel training, record keeping, sanitation, waste handling, and security. These SOPs also detail procedures for reporting observed deficiencies. The SOPs incorporate the requirements of federal and DA regulations pertaining to laboratory animal care and use.

USAISR animal care facilities and procedures are accredited by the Association for Assessment and Accreditation of Laboratory Animal Care (AAALAC). The criteria for AAALAC certification are rigorous and include all aspects of animal care from ventilation efficiency to record keeping. The current AAALAC certification renewal was approved on June 6, 1997, following an inspection conducted in October 1996 (Bentz, 1998c). The U.S. Department of Agriculture (USDA) also inspects USAISR animal facilities. Results of USDA inspections are recorded on Animal and Plant Health Inspection Service (APHIS) Form 7023. The most recent USDA inspection report was completed in October 1997 (USDA, 1997).

2.13 Human Health and Safety

In accordance with BAMC Memo 420-3, BAMC Regulation 385-1, BAMC Memoranda 40-48, 385-3, and 385-4, Occupational Safety and Health briefings and job safety training are conducted at initial briefings, periodic inservice sessions, and the annual training received by USAISR employees. Training for safety and hazardous materials management is conducted on initial entry, annually, and when update training is required. Training is documented in BAMC Form 999 (Bentz, 1998c).

Personnel working with animals receive training detailing associated hazards. Animal care workers are given an initial medical examination followed by routine medical surveillance as appropriate. Immunization programs for workers are in place for rabies, tetanus, and hepatitis B. Immunity is monitored through routine serosurveillance. BAMC industrial hygienists and preventive medicine personnel perform regular environmental monitoring of areas such as operating suites and necropsy rooms to ensure that airborne levels of chemicals (e.g., anesthetic gases, formaldehyde) are within permissible exposure limits.

2.14 Accidents and Incidents

In the event of an accident, BAMC Form 889 and/or DA Form 285 must be completed and the incident reported immediately to the section supervisor, Commander, Infection Control Nurse, and USAISR and BAMC safety officers. Injuries and/or illnesses resulting from activities conducted at USAISR facilities must be reported and tracked by the Infection Control Nurse, USAISR Safety Officer, and forwarded to the USAISR/BAMC Occupational Health and Safety Committee (Bentz, 1998c). Animal-induced injuries such as bites or scratches must be reported to supervisory personnel and recorded. All accident reports must be submitted to the USAISR or BAMC safety officer.

3.0 ALTERNATIVES CONSIDERED

3.1 Introduction

The proposed action and subject of this EA is the continued conduct of current and currently planned USAISR activities (Alternative I, the preferred alternative). During the preparation of this EA, two alternatives to the proposed action were identified. These alternatives include relocating USAISR activities to another geographic location (Alternative II), and ceasing USAISR activities (Alternative III, no action).

3.2 Alternative I – Continuing USAISR Activities

Alternative I encompasses continuing current and currently planned activities at the USAISR in their present scope using existing facilities. This alternative is preferred because the research activities conducted at USAISR are considered essential to fulfilling the mission of USAMRMC. Existing USAISR facilities are designed specifically for their current use and are newly constructed. The current location of USAISR at FSH and adjacent to BAMC facilitates the sharing of resources and expertise. USAISR research contributes not only to advancements in the trauma care available to military personnel, but to civilians as well. Alternative I is preferred as the option which best meets national defense needs.

3.3 Alternative II - Relocating USAISR Activities

This alternative entails moving USAISR activities to another location. This alternative is not preferred because existing USAISR facilities are newly constructed and designed specifically for their intended use. Constructing a new facility or modifying an existing facility for USAISR would disrupt and delay ongoing research, would not be cost effective, and would delay research progress.

3.4 Alternative III – Ceasing USAISR Activities (No Action)

Alternative III entails the cessation of USAISR activities. This alternative is not preferred because of the critical contributions made by USAISR research to the USAMRMC Combat Casualty Care Research Program. In addition, Alternative III would impair national defense by disrupting advancements that impact on the quality of trauma care received by U.S. military personnel on the battlefield.

4.0 AFFECTED ENVIRONMENT

4.1 Introduction

This section of the EA describes aspects of the biophysical and socioeconomic environment (i.e., resource areas) that could potentially be impacted by the proposed action.

4.2 Location and Physical Description

The USAISR is a tenant on the FSH Installation. The Installation covers 3,105 acres within the City of San Antonio in the south-central part of Texas. The City of San Antonio is 359.5 square miles and located within Bexar County. The San Antonio metropolitan area encompasses 3,338 square miles in Bexar, Comal, Guadalupe, and Wilson counties (Cain's Services, 1997; USACOE, 1996).

4.3 Land Use

In May 1870, the City of San Antonio donated 40.8 acres of land to the War Department to establish a permanent U.S. Army post. FSH has supported the U.S. Army mission as a border patrol installation, a stronghold against Indian attack, and a quartermaster depot. FSH now supports activities used for mobilization, medical training, patient care, medical research, and development. The USAISR has been located at FSH since 1946 and in its current location on the easternmost edge of FSH since 1996. Before the construction of Building 3600, BAMC activities were located in numerous structures dispersed throughout FSH. Facilities in the area of FSH on which the USAISR and BAMC are located are primarily used for medical activities. Prior to the construction of the new BAMC, the site contained a firing range, borrow pits, and a landfill (USACOE, 1988).

The land use patterns surrounding FSH are generally urban/suburban in character. There are commercial and residential areas surrounding the Installation. Within FSH itself there are wooded, scrub, and lawn areas; roads, sidewalks, and pathways; and structures of varying age, size, and design.

4.4 Climate

Bexar County has a modified subtropical climate due to its location on the edge of the Gulf Coastal Plain. The climate is predominantly continental in winter with northerly winds prevailing and measurable snow once every 3 or 4 years. Southeasterly winds from the Gulf of Mexico prevail during the summertime, and occasionally for long periods in the winter. The climate in summer is marine. Variations in topography, proximity to bodies of water, differences in air drainage, and differences in wind velocity and wind direction affect the temperature. Variations in topography also cause the length of the freeze-free season to differ significantly within Bexar County (USDA Natural Resources Conservation Service, 1991).

Mild winters and long, hot summers characterize the weather of the region. Skies are clear 30% of the time, partly cloudy 32%, and cloudy 38%. Annual precipitation in the San Antonio area is 30.98 inches, with thunderstorms occurring most frequently from April through September

(USDA Natural Resources Conservation Service, 1991; Reed Travel Group, 1997). The average high and low temperatures recorded for San Antonio over the past 29 years range from 95.3°F to 37.9°F. Mean monthly temperatures range from 85°F (summer) to 49.3°F (winter) with the highest temperatures occurring in July and the lowest occurring in January (National Climatic Data Center, 1990).

4.5 Geology

Elevations in Bexar County range from 500 feet to 1,900 feet above sea level with an average elevation of 701 feet above sea level. The topography of San Antonio consists of small hills (Cain's Services, 1997).

Geological group formations underlying Bexar County include Trinity, Fredericksburg, Washita, Midway, Wilcox, and Claiborne groups and formations in the Gulf and Recent series. Each group or series consists of one or more formations containing limestone, chalk, shale clay, marly clay, sandy clay, calcareous clay, sand, or sandstone (USDA Natural Resource Conservation Service, 1991).

The Balcones Escarpment, an area of faulted limestone, forms the southern edge of the Edwards Plateau. The escarpment runs northeast to southwest through the San Antonio region. The Edwards Plateau and the Gulf Coastal Plain are separated by the Balcones Fault Zone (FORSCOM, 1991). The Balcones Fault Zone runs southwest to northeast through the San Antonio area (Maclay, 1995). Water enters the San Antonio region of the Edwards aquifer, a carbonate aquifer, in part through faults in the Balcones fault zone (Maclay, 1995; Edwards Aquifer Research and Data Center [EARDC], 1997). The Edwards aquifer is the sole source of public water supply for the San Antonio area (see Section 4.7.2) (USGS, 1996). FSH (including USAISR) is located over the artesian zone of the Edwards aquifer (USACOE, 1996).

4.6 Soils

Most of the soils underlying BAMC are Lewisville silty clay. Other soils areas are of the Houston Black-Houston association. These are deep, clayey soils over calcareous clay and marl. Such soils are dark in color (black to dark gray), deep, and slow to permeate. The surface of this soil is 28 to 50 inches thick and clay or gravelly clay in texture. The soil type under and in the near vicinity of USAISR is Houston Black gravelly clay (1%-3% slopes). This soil is black in color and about 38 inches deep. It is generally comprised of 8%-18% gravel, although higher concentrations of gravel may be present in areas along ridgetops. Generally, runoff is medium to slow with erosion minimized by the presence of pebbles; however, because these soils have poor internal drainage, runoff can be rapid, resulting in serious erosion (USDA Natural Resources Conservation Service, 1991; USACOE, 1988).

4.7 Water Resources

4.7.1 Surface Water

The 1967 Water Rights Adjudication Act consolidated all riparian water rights (property-based) and claims into “certificates of adjudication” based on actual water use from 1963 to 1967. Of approximately 6,600 permit holders, 275 have access to most of Texas water. More than 90% of surface water in the state has been adjudicated. The Texas Natural Resource Conservation Commission (TNRCC) issues permits for the right to use surface water.

The TNRCC is authorized to develop and amend surface water quality standards for Texas under the Clean Water Act and Chapter 26 of the Texas Water Code. The TNRCC is the primary agency charged with water quality management, and must balance water needs of humans with the effects of water consumption on the environment. Water quality standards for Texas waters are based on use, including contact recreation (swimming), non-contact recreation (boating), and public water supply. The TNRCC monitors rivers and streams to assess water quality based on use (Texas Center for Policy Studies [TCPS], 1995).

Salado Creek is the primary drainage for the northern portion of FSH. Runoff is the primary contributor to the creek’s baseflow. The Alamo Ditch, a small tributary of the San Antonio River, drains the western part of the Installation. The central and southern sections of FSH are drained by the City of San Antonio storm drainage system. All water quality parameters for the Salado Creek watershed near FSH met TNRCC standards (USACOE, 1996). Surface water samples are collected along Salado Creek quarterly.

BAMC/USAISR facilities are not located within the 100- or 500-year flood plain of Salado Creek. As indicated in a 1987 study, an area near Binz-Engleman Road and W.W. White Road is highly vulnerable to flooding. When flooding occurs in this area, water covers the roadway, impeding traffic to BAMC/USAISR. When water covers the roadway, alternative routes to the BAMC campus are available, including I-35. A bridge is under construction at the site of roadway flooding.

4.7.2 Groundwater

USAISR activities use about 10.8 million gallons of water annually, estimated to be approximately 9%-10% of the water used by BAMC (Bentz, 1998d). FSH, its tenants, and the rapidly growing region in which they are situated rely on groundwater obtained from the Edwards aquifer. As such, issues pertaining to groundwater use and quality are important regionally.

FSH lies within the San Antonio region of the Edwards aquifer in the aquifer’s artesian zone. The U.S. Environmental Protection Agency (USEPA) has designated the Edwards aquifer as a “sole source” drinking water supply for the 1.5 million people of San Antonio and the Austin-San Antonio corridor. The sole source provision of the Federal Safe Drinking Water Act gives special protection to such water sources (TCPS, 1995).

Streams and rivers with origins in catchment areas on the Edwards Plateau are the primary source of direct recharge to the Edwards aquifer. Part of the San Antonio River Basin, including headwaters of Salado Creek, is in the recharge zone (EARDC, 1997). The U.S. Geological Survey (USGS) in cooperation with the Edwards Aquifer Authority (EAA) annually estimates recharge to and discharge from the Edwards aquifer. The Edwards aquifer has an estimated overall average annual recharge of 651,700 acre-feet. The 1996 estimated annual recharge for the San Antonio region aquifer is 324,300 acre-feet. In this area, recharge is predominantly from seepage from streams crossing the outcrop of the aquifer and from precipitation on the outcrop directly infiltrating the aquifer (USGS, 1996).

Discharge from the Edwards aquifer is primarily from wells and springs. Since 1968, annual discharge has consistently exceeded average annual recharge primarily due to doubling of well pumpage. Recharge during most of those years exceeded the average, resulting in an increased total spring flow. Average annual recharge is approximately equal to the sum of the average spring flow and average annual pumpage; there has been no long-term decrease in groundwater storage due to spring flow and pumpage (Maclay, 1995). The 1996 estimated annual discharge from wells and springs in the San Antonio area was 705,600 acre-feet. About 70% of the estimated annual discharge was from wells, with Bexar County using 58% of the total. In Bexar County, most well discharge was used for public water supply. Well discharge uses also include irrigation, industry, domestic uses, and stock (USGS, 1996).

San Antonio may face potentially serious water supply and resource challenges over the next 50 years. The quality of water from the Edwards aquifer is influenced by overpumping (i.e., pumping more water than is replaced through natural recharge processes) groundwater for human use and irrigation. Salt water encroachment, lowered groundwater tables, and subsidence have occurred in some areas of the aquifer because of overpumping. Development and industry are also potential contributors to groundwater contamination.

The Texas state legislature established local management authorities, such as the EAA, in areas of critical groundwater depletion to manage groundwater withdrawals through a permitting system (TCPS, 1997). There are eight federally listed threatened and endangered species whose habitat is dependent upon the Edwards aquifer. Excessive withdrawals from the Edwards aquifer may potentially result in habitat destruction for these species. FSH personnel in conjunction with the other four military bases in San Antonio are going through formal consultation with the U.S. Fish and Wildlife Service (USFWS) concerning these threatened and endangered species. A biological assessment has been prepared and a biological opinion will determine the water usage allowed for all military installations in San Antonio. In addition, the quantity of water pumped by military installations may be limited by the EAA's permit system.

The *FSH Water Use Reduction Plan* acknowledges the need for a comprehensive plan for water use and conservation. FSH Regulation 420-3 contains procedures and guidelines for water conservation (USACOE, 1996). FSH obtains drinking water from the Installation's five active pumping wells. These wells extend to depths of 728 to 1,106 feet. Water is distributed to USAISR from the BAMC Central Energy Plant. Water quality is monitored by periodically comparing well water samples to an aquifer sample obtained upstream of the Installation. The sampled water is described as moderately hard and of good quality (USACOE, 1996). Fluoride

and chlorine are added to the water prior to distribution (U.S. Army Center for Health Promotion and Preventive Medicine [USACHPPM], 1996).

4.8 Plant and Animal Ecology

An estimated 70% of FSH has been developed over the past 100 years and planted with ornamental lawns and landscape. Trees on the Installation include ash, live oak (*Quercus virginiana*), pecan, cedar elm, hackberry, ligustrum, honey locust, palm, and crepe myrtle (FORSCOM, 1991). Urban tolerant species populate the area including fox squirrels (*Sciurus niger*), house sparrows (*Passer domestica*), red-winged blackbirds (*Agelaius phoeniceus*), grackles (*Quiscalas species*), mockingbirds (*Mimus polygottos*), robins (*Turdus migratorius*), and chickadees (*Parus carolinensis*). The remaining 30% of FSH land consists of undisturbed habitat along the floodplain of Salado Creek. The native vegetation found there includes mesquite, hackberry, and crepe myrtle. These bottomlands provide protection for species including beaver (*Castor canadensis*), armadillo (*Dasypus novemcinctus*), skunk (*Mephitis mephitis*), cottontail rabbit (*Sylvilagus floridanus*), and opossum (*Didelphis virginiana*). Inventories of FSH flora and fauna are being conducted (USACOE, 1996).

Several federally listed endangered and/or threatened bird species inhabit Bexar County including the golden-cheeked warbler (*Dendroica chrysoparia*), American peregrine falcon (*Falco peregrinus anatum*), brown pelican (*Pelecanus occidentalis*), interior least tern (*Sterna antillarum athalassos*), and the black-capped vireo (*Vireo atricapillus*). The peregrine falcon (*Falco peregrinus*) and the arctic peregrine falcon (*Falco peregrinus tundrius*) are listed as federally endangered species due to similarity of appearance (Texas Parks and Wildlife Department, 1997). The Cagle's map turtle (*Graptemys caglei*) is a candidate for listing as an endangered/threatened species (Texas Parks and Wildlife Department, 1997).

Some wildlife species in Bexar County are recognized as threatened/endangered on a statewide level. Bird species common to Bexar County and listed as having statewide status include zone-tailed hawk (*Buteo albonotatus*), golden-cheeked warbler (*Dendroica chrysoparia*), reddish egret (*Egretta rufescens*), American peregrine falcon (*Falco peregrinus anatum*), arctic peregrine falcon (*Falco peregrinus tundrius*), whooping crane (*Grus americana*), wood stock (*Mycteria americana*), brown pelican (*Pelecanus occidentalis*), white-faced ibis (*Plegadis chihi*), interior least tern (*Sterna antillarum athalassos*), and the black-capped vireo (*Vireo atricapillus*) (Texas Parks and Wildlife Department, 1997). Detailed population information for listed species occurring on the Installation is available in the *Integrated Natural Resource Management Plan for FSH* (INRMP) (USACOE, 1996). Amphibians common to Bexar County and protected by the State of Texas include the Comal blind salamander (*Eurycea tridentifera*), black-spotted newt (*Notophthalmus meridionalis*), and the Mexican treefrog (*Smilisca baudinii*). Fish species found in Bexar County that are listed as state endangered/threatened species include the widemouth blindcat (*Satan eurystomus*) and the toothless blindcat (*Trogloglanis pattersoni*) (Texas Parks and Wildlife Department, 1997). Both species are endemic to the San Antonio Pool of the Edwards aquifer but are not known to occur in deep wells on the FSH Installation (Breslin, 1998). Reptile species on statewide status as endangered/threatened include: timber/canebrake rattlesnake (*Crotalus horridus*), indigo snake (*Drymarchon corais*), Texas tortoise (*Gopherus berlandieri*),

and the Texas horned lizard (*Phrynosoma cornutum*) (Texas Parks and Wildlife Department, 1997).

Not all listed species share the same probability of occurrence within a county. Some species are migrants or wintering residents only and some may be historic or considered extirpated within a county (Texas Parks and Wildlife Department, 1997). The Texas Parks and Wildlife Department reports no presently known occurrences of special species or natural communities within the immediate vicinity of FSH (Breslin, 1998).

4.9 Wetlands

The nearest wetland to USAISR is located slightly more than one-half mile away and is surrounded by highways. The wetland is palustrine, seasonally flooded, and characterized by persistent vegetation with emergent macrophyte growth (U.S. Fish and Wildlife Service, 1994). More distant wetlands are associated with the floodplain of Salado Creek or are hydrologically connected to the creek (USACOE, 1996).

4.10 Air Quality

The 1990 Federal Clean Air Act sets National Ambient Air Quality Standards (NAAQS), air quality standards for six pollutants: ozone (O₃), carbon monoxide (CO), sulfur dioxide (SO₂), nitrogen dioxide (NO₂), respirable particulate matter (PM₁₀), and lead (Pb) (TCPS, 1995). Air quality at FSH is regulated by the TNRCC on a state level and by the San Antonio Metro Health District. The Installation is located in TNRCC Air Quality Control Region 13, San Antonio and USEPA Air Quality Control Region 6, Dallas. The Air Quality Division at TNRCC describes the quality of air in and around FSH as good. The area of San Antonio, including UAISR at FSH, is currently in attainment status for NAAQS. No Notices of Violation have been issued to FSH during the previous 5 years. There are no significant sources of hazardous air pollutants on the Installation (Alvarez and Price, 1998).

4.11 Historical and Cultural Resources

The National Historic Preservation Act (NHPA) of 1966 and Executive Order 11593 mandate that federal agencies locate, inventory, and nominate to the National Register all historic resources under their jurisdiction or control. Army Regulation 200-4, Paragraph 1-19, requires the Installation Commander to establish a Cultural Resources Management Program. The 1997 Cultural Resources Management Plan for FSH provides for compliance with the NHPA regulations. The Installation Cultural Resources Manager must review all projects that involve historic resources.

A National Historic Landmark (NHL) district has been designated on FSH (Steely, 1997). Since 1974, NHPA Section 110 and Section 106 compliance efforts there have resulted in the identification, archaeological investigation, and documentation of several hundred historic properties on the Installation. FSH contains a National Historic Landmark District (NHL) and a National Register Conservation District (Bruseth, 1997). The National Register Division of the Texas Historical Commission conducted a review of the buildings, structures, objects, and districts of FSH for eligibility for historical designation by applying state and federal criteria.

Many FSH properties not within the NHL boundaries are eligible for listing in the National Register of Historic Places (Steely, 1997).

Prior to the construction of BAMC, surveys identified three archeological sites near the proposed facility. Construction of the BAMC campus did not affect these archeological sites (USACOE, 1996). There are no sites of cultural and/or historical significance adjacent to or on the BAMC campus (Schlatter, 1998; USACOE, 1988).

4.12 Energy Resources

The BAMC Central Energy Plant provides USAISR facilities with electricity, diesel fuel, steam and water. Annually USAISR uses approximately 5,548-megawatt hours of electricity, 501 gallons of diesel fuel, 23 million pounds of steam, and 10.8 million gallons of water. FSH natural gas consumption is metered by City Public Services. USAISR uses approximately 14.3 million cubic feet of natural gas annually (Bentz, 1998d).

4.13 Socioeconomic Environment

USAISR employs 248 full-time and 4 part-time personnel (Bentz, 1998a). The total population at FSH consists of 12,551 active duty, 12,975 family members, 20,118 Guard and Reserve members, and 5,544 civilians. Housing and exchange units at the Installation include: 277 officer family units; 716 enlisted family units; 1,783 enlisted units; 24 distinguished visitor units; 499 visiting officer units; 149 visiting enlisted units; 110 guest house units; a large main store with a food court; mini-malls; and two shoppettes (Army Times Publishing Company, 1997).

Between 1980 and 1994, the population of San Antonio grew from 785,940 to 1,014,300. During this same period, the population of the Metropolitan Statistical Area consisting of Bexar, Comal, Guadalupe, and Wilson counties grew from 1,072,125 to 1,410,400 (Cain's Services, 1997). According to 1990 U.S. Census data, the population of Bexar County was 1,185,394 and the population of the City of San Antonio was 935,933. The City of San Antonio population was 72.2% white, 19.6% American Indian, Eskimo, Aleut, or other, 7.0% black, and 1.1% Asian or Pacific Islander. Approximately 55% of the San Antonio population was of Hispanic origin. In 1989, approximately 22% of the population of San Antonio had income below the poverty level (U.S. Census Bureau, 1990).

The San Antonio metropolitan area experienced a 50% growth in wage and salary employment between 1980 and 1990. The largest employment sectors in San Antonio are government, trade, and services, providing 75% of payroll jobs. The most rapidly expanding industrial sector in San Antonio is services, with 28% growth over 5 years. The manufacturing sector accounts for only 9% and construction accounts for only 5% of wage and salary employment (Cain's Services, 1997).

FSH and the four Air Force bases in the San Antonio area employ more than 36,495 active duty military and 34,028 civilian personnel. The local economic impact of the DoD is over \$3 billion annually, which contributes to the economic stability of the area during recessionary periods (Cain's Services, 1997).

4.14 Noise

The major source of noise at FSH and USAISR is vehicular traffic. Noise is also generated by the occasional (less than three flights daily) arrival and departure of helicopters transporting patients. Helicopter flight routes are designed to follow transportation corridors to minimize disturbance (USACOE, 1996). Noise surveys are conducted as part of the BAMC industrial hygiene program. Noise hazards have not been identified at USAISR. Should noise hazards be identified in the future, workers at risk for noise-induced injury would be enrolled in a hearing conservation program.

4.15 Odors

There have been no reported complaints concerning odors from USAISR (Bentz, 1998e).

4.16 Transportation

FSH is located in the greater San Antonio area, which is accessible by rail, air, and highway. San Antonio International Airport lies north of the Installation and is accessible via US 281. Major highways in the San Antonio region include I-35, I-10, and I-37. Loop 410 circles the immediate metropolitan area while Loop 1604 provides regional transport. Amtrak, Greyhound Bus Lines, and Kerrville Bus Company service San Antonio. VIA Metropolitan Transit serves the greater metropolitan area with buses and streetcars.

4.17 Public Opinion

FSH has a Memorandum of Understanding with the Alamo Area Council of Government to inform government agencies and organizations of plans, programs, and projects that might impact the San Antonio area. There have been no concerns or inquiries made by the public regarding USAISR activities (Bentz, 1998a). News coverage concerning USAISR and/or BAMC trauma center, patient care, and educational activities has been positive (FSH Public Affairs Office, 1998).

5.0 ENVIRONMENTAL CONSEQUENCES

5.1 Introduction

In this section, the potential for adverse environmental impacts (direct, indirect, and cumulative) to result from ongoing and currently planned USAISR activities is discussed. This discussion identifies potential cause and effect relationships between the proposed action and impacts to the environment. This includes examining impacts which may not necessarily occur, but which are reasonably foreseeable. The term “consequence” refers to the outcome of an event or events without considering probability. Where possible, potential impacts are characterized both in terms of potential consequence and probability.

5.2 Environmental Consequences of USAISR Activities

5.2.1 *Land Use*

Current and currently planned USAISR activities are unlikely to impact land use because no construction or renovation is proposed or anticipated. In NEPA analyses conducted before Buildings 3600 and 3611 were constructed, it was determined that siting these facilities in their current location benefited area land use patterns (USACOE, 1988). The potential for Alternative II (relocating USAISR activities to another location) to impact land use patterns is possible. The probability and extent of impact of implementing Alternative II would depend upon the site selected and whether construction or renovation would be required. It is unlikely that land use patterns at FSH would be negatively impacted by implementing Alternative III (no action); however, there are foreseeable negative impacts to land use associated with maintaining an unused facility.

5.2.2 *Climate*

It is highly unlikely that implementing the proposed action or either of the alternatives will impact the climate of FSH or San Antonio. See Section 5.2.8 for discussion of the impacts to local air quality.

5.2.3 *Geology*

Impacts to geological resources resulting from current or currently planned USAISR activities are unlikely. Current and currently planned activities are conducted in existing facilities and because construction is neither planned nor anticipated, disruption of topography is unlikely. Relocating USAISR facilities to another site may result in negative geologic impacts if construction or extensive renovation is required. The significance of these impacts would be dependent on characteristics of both the selected site and the facility. Cessation of USAISR activities (Alternative III, no action) would be unlikely to impact geological resources.

5.2.4 *Soils*

Continuing activities at USAISR is unlikely to impact soils. Situated in conformance with local topography, there is no evidence to suggest that USAISR has contributed to excessive erosion. It

is unlikely that continuing USAISR activities will impact soils in the future. Negligible impacts to soils, topography, and erosion resulting from USAISR's contribution to local landfills through the disposal of waste materials. USAISR contributions are about 4.2% of the total solid waste stream of FSH. Impacts of Alternative II (relocating) will not likely differ from those of the proposed action. Implementing the no-action alternative would pose negligible potential for soil impacts.

5.2.5 Water Resources

5.2.5.1 Surface Water

Implementation of the proposed action is unlikely to diminish water resources at FSH, or in San Antonio or surrounding areas. Quantitatively, USAISR wastewater contributions are insignificant in comparison with total wastewater discharges resulting from BAMC and other FSH activities. The volume of wastewater generated at USAISR is not expected to significantly change from the conduct of current or currently planned activities. In accordance with federal and Texas regulations, wastewater generated by USAISR activities undergoes treatment by the SAWS prior to discharge. Potential adverse impacts to surface water quality resulting from the accidental discharge of restricted wastes are extremely unlikely. SOPs and facility design (berming, approved cabinets and containers) greatly reduce the probability of such an event occurring.

Impacts to surface water quality associated with Alternative II, relocating USAISR activities to another location, would be unlikely to differ from those of Alternative I, the proposed action. Impacts to surface water from USAISR activities at another location would be influenced by characteristics of the receiving water body, available sewage treatment facilities, and the age and condition of the available sewer system infrastructure. Implementing the no-action alternative (ceasing USAISR operations at FSH) would eliminate the wastewater currently generated, but would not have a significant impact on surface water quality at FSH or within the San Antonio area.

5.2.5.2 Groundwater

Because the area depends on the Edwards aquifer for source water, conservation is an important issue in and around San Antonio and is an integral component of community planning decisions (see Section 4.7.2). USAISR activities consume about 10.8 million gallons of water per year, an amount that is not anticipated to change as a result of current or currently planned activities. Groundwater use resulting from USAISR activities is small (less than 10%) compared to that of the BAMC and the total demand of other FSH activities (less than 1%). The annual total water consumption by FSH is less than 1% of the annual total Edwards aquifer water consumption. Nevertheless, the small consumption of groundwater by USAISR results in a minor negative impact to the environment since groundwater resources are limited in the San Antonio area. It is extremely unlikely that wastewater from USAISR activities would be discharged in a manner that would impact groundwater quality.

Relocating USAISR activities would reduce demands for water from the Edwards aquifer currently required; however, because these demands are comparatively small, Alternative II (relocating) would result in a minor benefit to water conservation efforts in the San Antonio area.

Impacts to groundwater resources from USAISR activities at another geographical location would be site-specific, depending on groundwater characteristics. Implementing the no-action alternative would eliminate the negligible adverse impact to groundwater resources resulting from USAISR activities.

5.2.6 *Plant and Animal Ecology*

It is unlikely that continuing USAISR activities in their current scope and size will significantly impact the plant and/or animal ecology of FSH or San Antonio. However, as discussed in Section 4.8, there are eight federally listed threatened and endangered species whose habitat is dependent upon the Edwards aquifer. Potential habitat destruction resulting from withdrawals from the Edwards aquifer is a concern. Currently, FSH personnel in conjunction with personnel from the other four military bases in San Antonio are consulting with the USFWS on the status of these threatened species. A biological opinion will determine the water usage allowed for all military installations in San Antonio. FSH, including USAISR, will likely have water limits imposed on it by EAA and the USFWS in the future. The timing of the biological opinion and future water restrictions is uncertain at this time.

It is unlikely that the impacts to plant and animal ecology associated with relocating USAISR activities to another geographical location (Alternative I) or ceasing USAISR activities (Alternative II) would differ greatly from those resulting from the proposed action. However, if relocating USAISR to another facility involved extensive renovations or construction, adverse impacts to habitats would be possible.

5.2.7 *Wetlands*

No impacts to wetlands are expected to result from continuing USAISR activities at FSH. The nearest wetland to the USAISR facilities is located more than one-half mile away and is surrounded by interstate highway. It is highly unlikely that current or currently planned USAISR activities would impact this wetland.

Impacts to wetlands associated with relocating USAISR activities would be site-dependent. Although it is highly unlikely that research activities conducted in adherence to applicable regulations would impact nearby wetlands, factors such as regional topography, land use patterns, and vegetation may influence observed impacts. It would be highly unlikely that ceasing USAISR activities (Alternative III) would impact existing wetlands on FSH.

5.2.8 *Air Quality*

Negligible negative impacts to air quality may result from continuing current and currently planned USAISR activities at FSH. Current regional air quality is good. Existing impacts from FSH activities have not significantly impacted regional or local air quality. USAISR impacts to offsite air quality are possible from the incineration of regulated medical wastes, and the contribution of on-road mobile sources of air pollution such as the trucks and automobiles that transport employees and provide services to USAISR. The contributions of these impacts to regional air quality are negligible based on good regional air quality.

Implementing Alternative II (relocating) is unlikely to result in significant adverse impacts to air quality. The likelihood of adverse impacts resulting from Alternative II is dependent on climatic characteristics and existing air quality of the selected site. In addition, impacts associated with relocating USAISR activities to another site may be influenced by the incinerator location. Implementing Alternative III (ceasing USAISR activities) would eliminate the minor impacts associated with the proposed action.

5.2.9 Historical and Cultural Resources

It is unlikely that the continued operation of USAISR will negatively impact historical or cultural resources located on the FSH Installation. USAISR activities are conducted within existing facilities and no construction or renovation is planned. Existing facilities were constructed in accordance with applicable laws and regulations protecting sites of historic or cultural importance. Historic sites at FSH are protected by federal law and DA regulations. Impacts to historical or cultural resources resulting from relocating USAISR activities (Alternative II) would be dependent on the selected location. Discontinuing USAISR activities (Alternative III, no action) will not impact historical or cultural resources.

5.2.10 Energy Resources

Implementation of the proposed action is not expected to result in adverse impacts to energy resources. The current energy usage of USAISR activities is small in comparison to the energy resource use of BAMC, minimal in comparison to the energy requirements of FSH, and minute in comparison to the energy requirements of the San Antonio region. The energy resource requirements of USAISR activities (electricity and natural gas) are not anticipated to change significantly from the conduct of current or currently planned activities.

It is unlikely that impacts to energy resources resulting from implementing Alternative II (relocating USAISR activities) will be significantly different from those resulting from implementing the proposed action. Ceasing USAISR activities would eliminate the negligible impacts associated with implementing the proposed action.

5.2.11 Socioeconomic Environment

Minor positive impacts to the socioeconomic environment in San Antonio are likely to result from implementing the proposed action. These impacts result from USAISR employment and purchases that contribute revenue to the local economy. These impacts are likely to be minor in comparison to the economic impacts of FSH. The positive impacts of the medical research conducted at USAISR are anticipated to continue into the future as the result of implementing the proposed action.

Implementing Alternative II (relocating) or Alternative III (no action) is unlikely to result in significant negative impacts to economic resources of the San Antonio region. Relocating USAISR activities to a new site may provide a minor positive economic impact from employment and use of regional goods and services. Implementing the no-action alternative (Alternative III) would eliminate the regional benefits realized from access to USAISR trauma care.

5.2.12 Noise

Continued conduct of USAISR activities will likely result in negligible noise impacts to FSH and the San Antonio region. Noise events include vehicle traffic to and from the facility and occasional helicopter flights associated with the transport of burn patients to BAMC or USAISR. Helicopter flights are routed over transportation corridors to mitigate disturbance to populated or sensitive areas. Vehicular traffic associated with USAISR operations is a small proportion of the total traffic on FSH. Noise surveys conducted as part of the BAMC industrial hygiene program have not identified noise hazards associated with routine operations within USAISR.

Noise impacts associated with relocating USAISR activities to another location will likely be similar to those associated with implementing the proposed action. The significance of noise impacts at another location will be influenced by the site selected. Ceasing USAISR activities at FSH will eliminate the minimal noise impacts associated with implementing the proposed action.

5.2.13 Odors

There have been no reported complaints concerning odors from USAISR. Therefore, it is unlikely that USAISR activities will significantly increase odors at FSH.

5.2.14 Transportation

The impacts to transportation resources in the San Antonio region associated with the conduct of routine operations at USAISR are negligible. USAISR-related vehicular traffic is a small component of traffic in the region. It is unlikely that traffic patterns on or near FSH will be adversely impacted by implementing the proposed action because USAISR activities will be conducted in an existing facility and the addition of employees is not anticipated.

Impacts to transportation resources associated with relocating USAISR to another location (Alternative II) will be site-dependent, although unlikely to be proportionally significant. Ceasing USAISR activities conducted at FSH will eliminate the negligible impacts associated with implementing the proposed action.

5.2.15 Public Opinion

The local community is kept aware of environmental issues at FSH through various mechanisms including press releases and communication with local government. Potential negative public opinion may be associated with aspects of ongoing research at USAISR that require the research use of animals. Potential positive public opinion may result from the benefits of USAISR research on the care and treatment of both military and civilian trauma and burn victims. The concept of using flight teams to provide early care to burn victims has been widely applied throughout the U.S.

Public opinion associated with relocating USAISR activities (Alternative II) may include dissatisfaction about loss of trauma care available to the region and loss of employment opportunities. Public opinion in the region to which USAISR would be relocated will be site-dependent.

Ceasing USAISR activities would likely result in negative public opinion about the potential loss of medical innovations in trauma care, loss of regional burn and extremity trauma support, loss of employment opportunities, and possible degradation of medical services available to injured service men and women.

5.2.16 Human Health and Safety

5.2.16.1 Worker Health and Safety

Potential adverse impacts to worker health and safety from routine operations at USAISR are unlikely. Facility design and work practice controls coupled with adherence to SOPs directing waste stream management practices and the safe handling and use of microorganisms, chemicals, and animals, and wastes mitigate potential risks to workers. Routine studies such as noise surveys and medical monitoring performed by preventive medicine and industrial hygiene personnel are conducted to measure and assess actual risks to worker health and safety. There have been no observed significant adverse impacts to worker health resulting from the conduct of USAISR activities over the previous 5 years (Bentz, 1998e).

Potential adverse impacts to worker health and safety resulting from the conduct of USAISR research activities at another location would likely be minimal and similar to those resulting from implementing the proposed action. Ceasing USAISR activities (Alternative III, no action) would eliminate potential impacts to worker health and safety.

5.2.16.2 Human Volunteer Health and Safety

Potential adverse or positive impacts to the health and safety of human volunteers participating as subjects in USAISR research protocols are project-specific. Risks and benefits to human subjects associated with participation in a research project must be assessed, evaluated, and approved before the start of the study. All research subjects must give informed consent. Potential adverse impacts to human volunteers are mitigated by adherence to laws, regulations, and USAISR policy and regulations that incorporate accepted standards for medical research involving human subjects.

Potential adverse or positive impacts to the health and safety of human volunteers resulting from relocating USAISR activities to another location will likely be similar to the impacts associated with the proposed action. Potential impacts will be project-specific. Regulations and standards for research requiring human volunteers must be followed regardless of geographical location.

Ceasing USAISR activities (Alternative III, no action) will eliminate both the potential risks and the potential benefits to human volunteer health and safety associated with participation in USAISR research.

5.2.16.3 Public Health and Safety

Adverse impacts to public health and safety resulting from ongoing USAISR activities have not been observed. It is unlikely that continued operation of USAISR will result in adverse impacts to public health and safety because adverse impacts are mitigated by adherence to the regulations and SOPs governing the handling use and disposal of potentially hazardous wastes. Positive impacts to public health and safety result from USAISR research and USAISR services provided to burn patients.

The impacts associated with implementing Alternative II (relocating) would likely be similar to those associated with the proposed action, but would result in loss of USAISR resources to the San Antonio region. Implementing the no-action alternative (Alternative III) would eliminate unforeseen potential adverse impacts, but would also eliminate the positive public health impacts attributable to current and currently planned USAISR activities.

5.2.16.4 Accidents and Incidents

Adverse impacts from accidents and incidents resulting from current USAISR activities have not been identified. The likelihood of adverse impacts to the public that could result from USAISR activities are mitigated by adherence to the regulations and SOPs developed for the safe conduct of ongoing activities and that govern the handling, use, and disposal of potentially hazardous materials and wastes.

Potential adverse impacts to the human health and safety resulting from relocating USAISR activities to another location will likely be similar to the impacts associated with the proposed action. Regulations and standards for the safe conduct of ongoing activities and for the handling, use, and disposal of potentially hazardous materials must be followed regardless of geographical location. Ceasing USAISR activities (Alternative III, no action) would eliminate both the potential adverse impacts to human health and safety from accidents or incidents that might result from USAISR activities.

5.2.17 Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low Income Populations*, requires that federal agencies preparing NEPA documents address whether the proposed action or alternatives will result in disproportionate adverse impacts to minority or low income populations. It is highly unlikely that implementing either the proposed action or the alternatives will result in significant adverse human health or environmental impacts to minority or low-income populations because no significant impacts have been identified with implementation of the proposed alternative.

5.3 Cumulative Impacts

The potential for USAISR activities to result in adverse human health and environmental impacts over time or as the result of their association with other activities in the area is unlikely. USAISR activities have been conducted at FSH since 1946 and no significant adverse impacts have been observed. Considerable advances have occurred in both engineering controls and work practices since the initiation of

USAISR activities at FSH. These advances, along with the promulgation of environmental and occupational health regulations, further reduce any potential environmental and human health impacts associated with USAISR activities. The contributions of USAISR activities to FSH total resource consumption and waste stream are minor to negligible. USAISR resource consumption (e.g., energy, water) and waste stream contributions (e.g., hazardous wastes, solid wastes, and wastewater) are approximately 9%-10% that of BAMC, and less than 1% that of FSH. It is highly unlikely that the conduct of current and currently planned USAISR activities will result in cumulative adverse environmental impact.

5.4 Comparison of the Proposed Action with the Alternatives

5.4.1 Alternative I - Continuing USAISR Activities

Alternative I entails continuing current and currently planned research activities at the USAISR, in their present scope and in existing facilities. Adverse environmental impacts associated with current and currently planned USAISR activities are negligible and primarily related to USAISR contributions to FSH waste streams. Potential adverse impacts to worker health and safety are minimal and mitigated by adherence to applicable SOPs and regulations.

5.4.2 Alternative II - Relocating USAISR Activities

Alternative II entails relocating current and currently planned future USAISR activities to a new location. Because the majority of potential environmental impacts associated with USAISR activities are site-independent, it is unlikely that implementing Alternative II would result in impacts that differ substantially from those associated with the proposed action. The engineering and work practice controls employed to minimize human health risk and contamination of the environment would be required at any site selected. Some potential environmental impacts are site-dependent, such as land use, economic impacts, and impacts to historical and cultural resources. The significance of impacts associated with implementing Alternative II also depend upon whether extensive renovation or construction would be required at a new location. Should construction or renovation be required, the probability of impacts occurring, although minimal, would nevertheless increase. While it is likely that relocating USAISR activities would delay research progress, implementing Alternative II would eliminate the potential adverse impacts to military medicine that would likely result from implementing Alternative III (no action).

5.4.3 Alternative III - Ceasing USAISR Research Activities (No Action)

Because USAISR is a functioning organization, the no-action alternative entails ceasing activities currently performed. Implementation of this alternative would eliminate the minor to negligible potential adverse environmental impacts (principally waste stream impacts) attributed to implementing the proposed action. Ceasing USAISR activities would eliminate the significant positive impacts resulting from USAISR activities, a significant component of the Army's Combat Casualty Care Research Program, which is funded by Congress in support of national defense needs.

6.0 CONCLUSIONS

The principal conclusion of this EA is that current and currently planned USAISR activities (Alternative I, the preferred alternative) are unlikely to result in significant adverse environmental impacts and are likely to result in important benefits to the U.S. by enhancing medical knowledge and treatments available to injured service personnel. Relocating USAISR to another location (Alternative II) will not likely alter the environmental impacts associated with conducting USAISR activities, but will delay achieving USAISR mission requirements. Discontinuing USAISR activities (Alternative III, no action) will eliminate the minor to negligible environmental impacts associated with conducting USAISR activities, but will also eliminate the significant benefits resulting from USAISR research and medical services.

Current and currently planned USAISR activities have been and will continue to be conducted without significant environmental impact. The most severe potential effects associated with USAISR are predicted to be minor or negligible, and to date, all observed effects have been insignificant. Potential risks to human health and the environment will continue to be mitigated by applying required standards, practices, and controls pertaining to the safe use, and disposal of hazardous materials; the protection and conservation of natural resources; and the safe and ethical conduct of studies requiring human and animal subjects.

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10.0 ACRONYMS AND ABBREVIATIONS

AAALAC	Association for Assessment and Accreditation of Laboratory Animal Care
APHIS	Animal and Plant Health Inspection Service
AR	Army Regulation
BAMC	Brooke Army Medical Center
CDC	Centers for Disease Control & Prevention
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	Carbon monoxide
DA	Department of the Army
DoD	Department of Defense
EA	Environmental Assessment
EAA	Edwards Aquifer Authority
EARDC	Edwards Aquifer Research & Data Center
EIS	Environmental Impact Statement
FORSCOM	U.S. Army Forces Command
FSH	Fort Sam Houston
HURC	Human Use and Review Committee
LAMS	Laboratory Animal Medical Services
MEDCOM	U.S. Army Medical Command
MSDS	Material Safety Data Sheet
NAAQS	National Ambient Air Quality Standards
NCOIC	Non-Commissioned Office-in-Charge
NEPA	National Environmental Policy Act
NHL	National Historic Landmark
NHLD	National Historic Landmark District
NHPA	National Historic Preservation Act
NIH	National Institutes of Health
NO ₂	Nitrogen dioxide
NRC	U.S. Nuclear Regulatory Commission
O ₃	Ozone
OSHA	Occupational Safety & Health Act
PM10	Respirable particulate matter
SAPs	Satellite Accumulation Points
SAWS	San Antonio Water System
SO ₂	Sulfur dioxide
SOP	Standard Operating Procedure
TCPS	Texas Center for Policy Studies
TNRCC	Texas Natural Resource Conservation Commission
USACHPPM	U.S. Army Center for Health Promotion & Preventive Medicine
USACOE	U.S. Army Corps of Engineers
USAISR	U.S. Army Institute of Surgical Research
USAMRMC	U.S. Army Medical Research & Materiel Command
USDA	U.S. Department of Agriculture

USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey